REMARKS

Claims 1-24 are all the claims pending in the application. The Examiner rejects claims 1-3, 6-9,11,14-15 and 21-22 under 35 U.S.C. §102(b) as being anticipated by Drees (US 5,932,953). In addition, the Examiner rejects claims 10 and 16-18 as being unpatentable over Drees in view of Ueyangi (US Application Publication 2002/0017138 A1), and claims 12 and 23 as being unpatentable over Drees in view of Wohltjen (US 4,312,228). The Examiner objects to claims 4-5, 13, 19-20, and 24 as being dependent upon a reject base claim, but indicates these claims would be allowable if rewritten in independent form.

Applicant appreciates the indication of allowable subject matter in claims 4-5, 13, 19-20, and 24.

§ 102(b) Rejection

Claims 1-3, 6-9,11,14-15 and 21-22 have been rejected under 35 U.S.C. 102(b) as being anticipated by Drees (US 5,932,953).

A proper rejection for anticipation under § 102 requires complete identity of invention. The claimed invention, including each element thereof as recited in the claims, must be disclosed or embodied, either expressly or inherently, in a single reference. Scripps Clinic & Research Found. v. Genentech Inc., 927 F.2d 1565, 1576, 18 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 1991); Standard Havens Prods., Inc. v. Gencor Indus., Inc., 953 F.2d 1360, 1369, 21 U.S.P.Q.2d 1321, 1328 (Fed. Cir. 1991). Applicant respectfully traverses these rejections.

Independent claims 1 and 14:

Both the application and Drees are directed towards piezoelectric sensors the can detect material bound to a surface of a resonating cavity by comparing the phase shift of input and output signals, and measuring the difference in the phase shift between a reference cavity and a measurement cavity. The Drees resonating cavities are shown in Fig. 5B and described below:

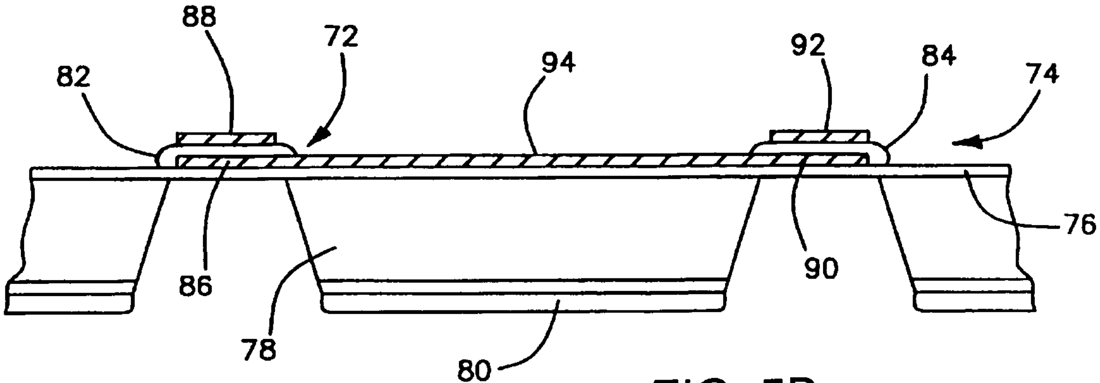


FIG. 5B

Drees is directed to a method and system for detecting material using piezoelectric resonators and teaches a two-port reference and sensing resonator combination as shown in FIG. 5B. The two resonators are supported on a thin SiO_2 layer, which is thermally grown on a silicon substrate. The portions of the Si substrate under the resonators are etched away to allow the resonators to undergo resonant movement. The bottom of the Si substrate has a layer of silver paint 80 applied thereto serving as a grounding plane.

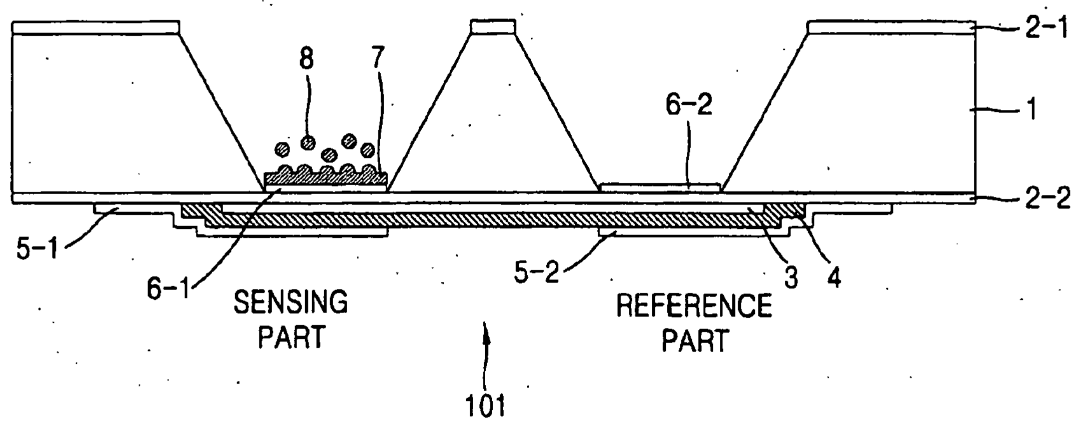
Each resonator has an epitaxially deposited AlN or ZnO piezoelectric layer providing a shear mode resonance frequency of 900 MHz. The piezoelectric layer is in the shape of a square. A rectangular input electrode and a rectangular output electrode are formed on opposite sides of the piezoelectric layer. *See*, Drees, col. 7, line 45 to col. 8, line 9. Therefore, each of the two resonators consists of a piezoelectric layer sandwiched between an input and an output electrode and supported on a thin SiO_2 layer, and wherein a supporting substrate has been etched away to expose the thin SiO_2 supporting layer.

The application is also directed to a material sensing sensor and module using thin film bulk acoustic resonator and teaching a two-port reference and sensing combination. Referring to FIG. 2 in the application, each acoustic resonator has piezoelectric material sandwiched between a common and an upper electrode and supported by a lower membrane, and wherein a substrate has been etched away to expose the lower membrane. However, the application also teaches and claims a **reactive layer** (identified as element 7 in each of FIGS. 2, 4, 5, and 6) **deposited within the sensing resonator cavity**. The material for the reactive layer may be selected depending on

the types of the target material. *See*, application, p. 12, lines 8-15. This reactive layer is not taught or suggested by Drees.

The application's corresponding resonating cavities are shown on Fig. 2 below:

FIG. 2



Claims 1 and 14 recite a reactive layer as part of the first thin film bulk acoustic resonator shown as element 7 of Fig. 2. The reactive layer binds the material to be detected (element 8) to the resonator thereby changing the resonating frequency of the sensing cavity thereby making element 8 detectable. Because of this reactive layer being deposited in the sensing resonator and not the reference resonator, the resonating frequencies of the sensing and resonating resonators differ and the material 8 can be detected by measuring the difference between the resonating frequencies.

The Examiner rejected applicants' arguments in response to the previous Office Action stating that "Drees teaches SiO_2 which is a reactive layer." *(Office Action dated March 13, 2006, paragraph 7, page 5.)* Applicants respectfully disagree with the Examiner's statement that SiO_2 is a reactive layer. In each of the application and Drees, the resonating cavities are etched or formed from the substrate (*see*, Drees, col. 7, lines 55-57 and application paragraph 0047). The substrates in each case may be Si, and Si (commonly a manufactured silicon crystal) is selected

for the substrate because it is generally inert. Drees has a layer of SiO_2 forming part of the resonator cavities, and silicon dioxide is a major component of glass. A well known property of glass is that it is inert to most substances under normal temperature and pressure conditions. Therefore, a substrate of Si with a layer of SiO_2 will be inert under normal temperature and pressure conditions. The application has a membrane, see 2-1 and 2-2 of Fig. 2, as part of the resonators, and the membrane is a low stress SiNx thin film that does not interfere with the operation of the resonators. *See*, Application, paragraph 0050.

To overcome an inert substrate and to attract material to be detected, the application recites and claims a reactive layer (element 7, Fig. 2) within the sensing resonator to attract the target material. "A material for the reactive layer 7 can be selected depending on types of the target material. For example, the reactive layer 7 can be used as a reactive material for detecting the prostate cancer or a material for detecting the stomach cancer." *See*, Application, paragraph 0055. Therefore, the reactive layer must be in addition to a substrate as recited in claim 1, "a material sensing sensor ... comprising a first acoustic resonator ... further compris[ing] a reactive layer."

An additional limitation of claim 1 is a reference resonator for generating a reference resonant frequency. This additional limitation does not further comprise a reference layer. The purpose of the reactive layer in the first resonator is to attract target material, and the presence of the target material in the first resonator alters the resonant frequency. The reference resonator does not attract the target material (because it lacks the reactive layer) and resonates at a different frequency. The difference between the reference resonant frequency and the resonant frequency of the first resonator may be used to detect the amount and type of target material. Because both the first resonator and the reference resonator are formed from the same substrate, it is only because the reactive layer is present in the first resonator and not the reference resonator that causes a frequency difference.

Comparing the resonators taught by Drees in Fig. 5B and the application's resonators of Fig. 2, Drees omits any reference to a reactive layer in the sensing resonator. Drees does not teach any structure comparable to element 7 of the application Fig. 2. Therefore, Drees does not teach a reactive layer, and because the reactive layer is in addition to a substrate, the substrate cannot be the reactive layer. Further, Si and SiO_2 are usually selected as substrate materials

because they are not reactive, and therefore for this additional reason, the substrate or the SiO_2 cannot be a reactive layer.

Independent claims 1 and 14 have been amended to clarify that the sensors include a substrate, and their respective dependent claims have been amended accordingly for the same purpose.

Applicant respectfully submits that because Drees does not teach each and every element of independent claims 1 and 14, Drees does not anticipate the invention of claims 1 and 14. Thus, for at least the reasons discussed above, claims 1 and 14 are allowable. Claims 2-13 and 14-24 depend from claims 1 and 14 and therefore are also allowable.

<u>Dependent claims 2-3, 6-9, 11, 13-15, and 21-22:</u>

Each of the above listed dependent claims depends from an allowable independent claim and is therefore allowable. Applicant respectfully request reconsideration and withdrawal of the rejection.

<u>§ 103(a) Rejection</u>

Claims 10 and 16-18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Drees in view of Ueyanagi, and claims 12 and 23 as being unpatentatble over Drees in view of Wohltjen. To establish a *prima facie* case of obviousness under 103(a), three basic criteria must be met one of which is that the prior art reference (or references when combined) must teach or suggest all the claim limitations. *See*, MPEP 2143.

<u>Claims 10 and 16-18</u>

Ueyanagi is directed to an acceleration sensor chip comprising a support frame part, and a sensor structure including at least one displaceable weight part, and a beam part for connecting the weight part to the support part, the support frame part and the sensor structure being formed on a silicon substrate through an insulation layer, wherein the insulation layer between the sensor structure and the silicon substrate is removed, the beam part comprising a plurality of sets of beams which are parallel to each other, the weight part is connected to the support frame part by the plurality of sets of parallel beams, and at least two semiconductor strain gauges are formed

on the surface of at least one set of the plurality of sets of parallel beams. However, Ueyanagi is silent on providing a reactive layer in a piezoelectric resonator.

Claims 10 and 16-18 are dependent from independent claims 1 and 14, each of the independent claims requiring a reactive layer. Dependent claims 10 and 16-18 are related to limitations of chip and sensor fabrication of the piezoelectric resonators having a reactive layer of claims 1 and 14. When taken together, the combination of Drees and Ueyanagi fail to teach or suggest a piezoelectric resonator having a reactive layer.

Because, neither Drees nor Ueyanagi, nor the combination thereof teaches all the limitations of claims 10 and 16-18, the prima facie case of obviousness fails, and claims 10 and 16-18 are allowable. Applicant respectfully requests reconsideration and withdrawal of the rejection.

Claims 12 and 23

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143.

Claims 12 and 23 are dependent from independent claims 1 and 14, each of the independent claims requiring a reactive layer. Claims 12 and 23 relate to a signal processor having a sensing oscillator, a reference oscillator, an RF signal mixer, and a power measuring unit. The Examiner relies upon Drees for disclosing the oscillators and the power measuring unit, and upon Wohltjen for disclosing the RF mixer.

Wohltjen is directed to a method for detecting a substance, which comprises generating a surface acoustic wave in a piezoelectric material element coated on the surface through which the wave travels with a material selectively interactive with said substance; contacting said substance with the coating material thereby altering at least one property of the surface acoustic

wave; and measuring the alteration of a wave property as an indication of the presence of the substance.

As discussed above, Drees teaches a sensor having a sensing resonator and a reference resonator, each without a reactive layer, but wherein resonator has piezoelectric material upon which two electrodes are formed. Wohltjen discloses a single sensor for detecting or sensing a substance, wherein the sensor comprises a piezoelectric material having a coating that selectively interacts with the substance. It is not possible to combine Wohltjen and to have Wohltjen's coating be applied to Drees's piezoelectric material because Drees's piezoelectric material has electrodes formed on each of the two surfaces. *See*, e.g., Drees, elements 82, 86, and 88 of FIG. 5B. Because Wohltjen's coating cannot be applied to Drees's piezoelectric material, there is no motivation to combine Drees and Wohltjen within either Drees or Wohltjen, and the *prima facie* case for obviousness must fail.

Further, even if Drees and Wohltjen could be combined, the combination would teach that each of Drees's two resonators would have Wohltjen's coating. This teaching is contrary to independent claims 1 and 14, which require a reactive coating be applied to only the sensing resonator. Therefore, the combination of Drees and Wohltjen do not teach all the limitations of the independent claims. For this additional reason, the *prima facie* case for obviousness must fail.

Because the *prima facie* case for obviousness has not been made, Applicant respectfully requests reconsideration and withdrawal of the rejection.

CONCLUSION

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,
Lee, Hong, Degerman, Kang & Schmadeka

Date: May 25, 2006

By: ________________________

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